DISPOSABLE/RECYCLABLE PALLET AND METHOD

FIELD OF THE INVENTION

The present invention relates generally to pallets used to support and transport a load of packages, and, in particular, to disposable and/or recyclable pallets and methods for producing the same.

BACKGROUND OF THE INVENTION

Pallets are typically used to support a load of packages, allowing the load to be lifted and transported by a lift truck such as a forklift. Several layers of packages may be loaded onto a pallet, and the load may then be secured around its circumference using, for example, flexible wrap or shrink-wrap in order to stabilize the load on the pallet.

Some pallets have a platform upon which the packages are loaded and a base having channels adapted to receive the "forks" of a forklift. These pallets, hereinafter referred to as "platform-type pallets", are typically constructed from wood or plastic, and may be re-used multiple times. Disadvantages to using platform-type pallets involve the cost of producing the pallet, space required for and cost of storing the pallets, cost of shipping the pallet and its load to their destination, and cost and inconvenience of shipping the pallet back from its destination so it may be reused. The shipping costs are even more significant for relatively heavier pallets (e.g., wood pallets). Due to weight restrictions, the amount of product that can be shipped with the relatively heavier pallets is reduced. Furthermore, while these pallets are generally reusable, they are subject to breakage (especially wood pallets).

A relatively thin and lightweight alternative to a platform-type pallet is known as a "slip sheet" or "slip pallet". Referring to Fig. 1, a conventional slip pallet 10 may be, for example, a thin sheet of lightweight material such as plastic having one or more extending edges 12. The slip pallet 10 is loaded with packages 20 and the packages are usually wrapped around the

circumference of the load (i.e., around a vertical axis) in order to stabilize the load 22. A specially adapted lift truck 24 grasps an edge, e.g. 12, of the slip pallet 10, pulls the slip pallet 10 onto a platform 26, and then lifts and transports the load 22 as desired. As the load 22 is lifted and transferred onto the platform 26, the weight of the load 22 shifts from the leading end 14 to the opposite (trailing) end 16 (as indicated by "L1" and "L2"), possibly damaging packages (e.g., 20a, 20b) located on the lowermost layers 18 on these ends 14, 16. The greater the lift angle "A", the greater the weight "L2" exerted on the packages (e.g., 20b) located on the trailing end 16, especially those on the lowermost layers 18.

Using either a platform-type pallet or a slip pallet, additional damage may occur to the lowermost layers of packages during shipping due to vibration and jostling of the load.

In view of the above, it is an object of the present invention to provide a pallet that essentially functions as a disposable/recyclable platform-type pallet. It is also an object of the present invention to provide a pallet that provides a shock-absorbing effect during transport of the load. It is a further object of the present invention to provide a method for producing such a pallet.

SUMMARY OF THE INVENTION

A pallet for supporting a load of packages is disclosed. The pallet includes a support structure comprising flexible film wrapped around at least one of the layers of the load (e.g., the lowermost layer). The flexible film is wrapped around two axes which are generally perpendicular to one another and preferably located within the same plane such that the flexible film covers at least a majority of the layer(s). The pallet also includes a base adhered to the flexible film which is adapted to receive forks of a forklift. The base may be constructed from multiple pieces of lightweight material, which is preferably a disposable/recyclable material such as plastic foam (a.k.a. Styrofoam).

A method for producing the pallet of the present invention is also disclosed. The method includes the initial steps of wrapping at least one of the layers of the load with a flexible film around a first axis, and then wrapping the same layer(s) with a flexible film around a second axis which is generally perpendicular to the first axis and preferably located on the same plane. Then, the base described above is adhered to the flexible film. If plastic foam such as Styrofoam is utilized, the base may be adhered to the flexible film by providing plastic foam pieces which are not fully cured, pressing the plastic foam pieces onto the flexible film, and then allowing the plastic foam pieces to fully cure, thereby causing the pieces to adhere to the flexible film. An alternative method utilizes plastic foam pieces which may be re-melted on a surface thereof and then adhered to the flexible film.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative and presently preferred embodiments of the invention are illustrated in the drawings in which:

Fig. 1 is a side elevation view of a lift truck manipulating a load on a conventional slip pallet;

Fig. 2 is an isometric view of a load on the pallet of the present invention;

Fig. 3 is an isometric, exploded view of the pallet of Fig. 2 with the load removed;

Fig. 4 is a bottom plan view of the pallet of Fig. 2;

Fig. 5 is a bottom plan view of another embodiment of pallet; and

Fig. 6 is a front elevation view of a load on the pallet of Fig. 2 being lifted by the forks of a forklift.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Fig. 2, the pallet 100 of the present invention is adapted to support a load 50 of packages 52, allowing the load to be lifted and transported by a conventional lift truck such as a forklift. A typical load 50 is

comprised of several layers 54, including a lowermost layer 54a. The packages 52 may be, for example, rectangular-shaped cartons as shown in the drawings. However, these packages 52 are merely exemplary, and it is to be understood that the pallet 100 of the present invention may be adapted to support other types of packages. Furthermore, the size of the load 50 shown is also merely exemplary, and the pallet 100 of the present invention may be adapted to support other load configurations. For example, several loads 50 and pallets 100 may be stacked on top of one another, and the lowermost pallet 100 may be adapted to support all of the other loads 50 and pallets 100 thereon.

As shown in Figs. 2-3, the pallet 100 may comprise a base 102 and a support structure 104. The support structure 104 utilizes at least one of the lowermost layers (e.g., 54a) of the load 50 as a "platform" to support the remaining layers 54. While the lowermost layer 54a will be described relative to the support structure 104, it is to be understood that two or more layers 54 may be utilized to produce the support structure 104.

With reference to Fig. 3, a layer 54a of packages 52 is arranged adjacent to one another in a desired configuration, such as, for example, a square or rectangular configuration (commonly referred to as "palletization", or arranging packages into a pallet-sized layer). The layer 54a of packages 52 may comprise a top surface 60, a bottom surface 62, a first side surface 64, a second side surface 66, a third side surface 68, and a fourth side surface 70. The layer 54a of packages 52 is then wrapped in a flexible film 110 in the manner discussed below such that all of the surfaces 60, 62, 64, 66, 68, 70 (or at least a majority thereof) are covered in flexible film 110, allowing the wrapped layer 54a to function as a "support structure" to support the remaining layers 54 (Fig. 2), similarly to the platform of a platform-type pallet. Then, the base 102, which may be comprised of multiple pieces 106 of lightweight material, is adhered to the flexible film 110 on the bottom surface 62 of the layer 54a. After loading the remaining layers 54 of packages 52 onto the pallet 100, the entire load 50 (Fig. 2), may

be secured around its circumference (i.e., around side surfaces 64, 66, 68, 70 of layer 54a and the corresponding side surfaces of the remaining layers 54) using, for example, flexible wrap or shrink wrap in order to stabilize the load on the pallet as is well-known in the art. By utilizing one or more layers 54 of the load 50 for the support structure 104, the entire pallet 100 may be dismantled upon arrival to its destination, and the entire pallet 100 and load 50 may be utilized, recycled, and/or disposed of. Specifically, the layer(s) 54 of packages 52 used for the support structure 104 will, of course, be utilized by the end-user along with the rest of the load 50. The flexible film 110 covering the layer(s) 54 as well as the base 102 may be constructed from disposable/recyclable materials. Thus, upon dismantling the pallet 100, the flexible film 110 and the base 102 may be disposed of and/or recycled. The term "disposable/recyclable" as used throughout this application is intended to encompass the conventional definitions of both the terms "disposable" and "recyclable", since an end-user of a disposable/recyclable product usually has the option of whether to dispose of or recycle the product.

The flexible film 110 may be, for example, a plastic stretch wrap material manufactured by ADU Stretch Films of Tulsa, Oklahoma. The flexible film 110 may be wrapped around the packages 52 using conventional stretch wrap equipment such as that sold by Mima of Tamarac, Florida (see "www.itwmima.com"). As shown in Fig. 3, the layer 54a of packages is preferably wrapped with flexible film 110 around two axes AA, BB. Specifically, the flexible film 110 may be applied to the top surface 60, first side surface 64, bottom surface 62, and second side surface 66 in a first direction, e.g., R1 (this direction may be either clockwise or counterclockwise), around axis AA. The film 110 is shifted along the load in direction D1, preferably overlapping the previous wrap somewhat, until all of the surfaces 60, 62, 64, 66 (or at least a majority thereof) are covered with flexible film 110. It may be desirable to cover the surfaces 60, 62, 64, 66 with more than one layer of flexible film 110, as described in further detail below. The flexible film 110 may then be applied to the top surface 60, third

side surface 68, bottom surface 62, and fourth side surface 70 in a second direction, e.g., R2 (again, this direction may be either clockwise or counterclockwise), around axis BB. The film is shifted along the load in direction D2, preferably overlapping the previous wrap somewhat, until all of the surfaces 60, 62, 68, 70 (or at least a majority thereof) are covered with flexible film 110. Again, it may be desirable to cover the surfaces 60, 62, 68, 70 with more than one layer of flexible film 110, as described in further detail below. It may also be desirable to leave one or more openings (not shown) within the flexible film 110 on one or more of the surfaces (in particular, on the bottom surface 62 and one or more of the side surfaces 65, 66, 68, 70) to allow for drainage of a leaking package 52. The axes AA, BB are most preferably located on the same plane (e.g., horizontal plane ABAB), and these axes AA, BB may be generally perpendicular to one another as shown in Fig. 3, so that the top surface 60 and bottom surface 62 are covered with twice as much flexible film 110 as the sides 64, 66, 68, 70.

As noted above, the base 102 is adhered to the flexible film 110 on the bottom surface 62 of the layer 54a. The base 102 must therefore be strong enough to support the entire load 50 (as well as other loads and disposable/recyclable pallets which may be stacked on top of this load as noted above), and is preferably constructed of a lightweight, recyclable/ disposable material such as the plastic foam known as "Styrofoam". By utilizing a resilient material such as plastic foam, the base 102 provides a shock-absorbing effect and is a damper to harmonic oscillations which minimizes damage to the packages 52 due to vibration and jostling of the load 50 during transportation thereof. However, the base 102 may be constructed from other materials such as rubber, plastic, or wood, including materials which have previously been recycled such as prefabricated wood.

The base 102 may be adhered to the flexible film 110 on the bottom surface 62 using any conventional adhesive such as two-sided tape. However, by using an injection-molded material such as plastic foam (a.k.a. Styrofoam), the need to use a separate adhesive may be avoided.

Specifically, when plastic foam is removed from a mold, it remains tacky for a certain period of time. In a first method, a base 102 constructed from plastic foam may be pressed onto the flexible film 110 on the bottom surface 62 of the packages 52 while the base 102 is still tacky and then allowed to fully cure, thereby securing the base 102 to the flexible film 110. In another method, a base 102 constructed from plastic foam which has already cured may be utilized. At least one surface on the base 102 (e.g., surface 107 on each of the pieces 106, Fig. 3) may be heated until that surface 107 is tacky or partially melted. Then, the tacky surface 107 may be pressed to the flexible film 110 on the bottom surface 62 of the packages 52. When the base 102 cools down, it will be adhered to the flexible film 110.

As shown in Figs. 2 and 4, the base 102 preferably includes channels 108 for receiving the forks (e.g., 56, Fig. 6) of a forklift. The base 102 may be adapted to receive the forks of a forklift from any side 120, 122, 124, 126 thereof as shown, or it may be adapted to receive a forklift from only two of those sides, e.g., 120, 122, as shown in Fig. 5. To create the channels 108 shown in Figs. 2 and 4, an exemplary base 102 may be comprised of multiple pieces 106 as noted above. To create the channels 208 shown in Fig. 5, elongate pieces 206 may be provided which, other than their elongated shape, may be identical to the pieces 106 described herein. Alternatively (not shown), the base 102 may be comprised of a single piece of material as long as channels 108, 208 are provided for use by a forklift. For example, the pieces 106, 206 shown may be connected by thinner pieces of material within the channels 108, 208.

The pieces 106 should have a relatively uniform height "H1" (Fig. 3) which leaves enough clearance "H2" (Fig. 2) under the load 50 to allow the forks (e.g., 56, Fig. 6) of a forklift to be easily inserted into the channels 108. For example, the height of the pieces "H1" may be between approximately 3 and 4 inches. The clearance "H2" would be equal to the height of the pieces "H1" less any settling of the pieces 106 due to the weight of the load

50, the amount of settling depending partly on the material used for the base 102.

Referring now to Fig. 4, the pieces 106 may have any desired surface dimension, e.g., "W2" by "W3". While rectangular-shaped pieces 106 are shown in the drawings, it is to be understood that the pieces 106 may have any cross-sectional shape such as, for example, square, circular, or polygonal. Furthermore, the surface dimension of each pieces 106 need not be equal to the surface dimension of any other piece 106, except as necessary to create adequate channels 108. The "footprint" of the base is equal to the total surface area, for example "A1" + "A2" + "A3" + "A4" + "A5" + "A6" + "A7" + "A8" + "A9" of the pieces 106, where the surface area of each piece, e.g., "A1", is equal to the surface dimensions of each piece multiplied together, e.g., "W2" x "W3". The desired footprint as compared to the total surface area "W4" x "W5" of the bottom surface 62 depends on the weight of the load 50 as well as the material used for the base 102, as shown in the example below.

The particular characteristics of the flexible film 110 and the wrapping thereof, as well as the base 102, may vary according to particular characteristics of the load 50. As an example, a load 50 of packages 52 (which may contain, for example, filled beverage cans) may weigh approximately 2,200 lbs. To provide a sufficiently strong yet cost-efficient pallet 100 in accordance with the present invention, a flexible film 110 such as a plastic stretch wrap having a film gauge of between approximately 0.0075 and 0.0095 inches, and most preferably approximately 0.008 inches, may be utilized. This film 110 may have a pre-stretch of between approximately 100 and 200%, but most preferably closer to 200%. The stretch force setting on the stretch wrap equipment may be between approximately 20 and 50 lbs, and most preferably approximately 25 lbs. It should be noted that the film gauge and the stretch force setting should be carefully chosen with regard to the strength the packages and package contents. Specifically, a higher gauge film requires a higher stretch force

setting, and a stretch force setting that is too high may cause damage to the packages 52 (especially cardboard packages).

In this example, the overlap noted above may be between approximately 25% and 40%, and most preferably approximately 30%, of the width "W1" (Fig. 3) of the flexible film 110. It was found that damage known as "corner crush" was minimized with a relatively low overlap (e.g., approximately 25% of "W1" in this example). However, lateral movement of the packages 52 was minimized with a relatively high overlap (e.g., approximately 50% of "W1"). Thus, the overlap may be adjusted to minimize the undesired effects. The total number of complete wraps around each axis AA, BB may be between three and five, i.e., the total number of layers of flexible film 110 in this example may be between six and ten. Should a stronger pallet be desired, and/or a heavier load applied, the total number of layers of flexible film may easily be increased, especially since the cost of the flexible film itself is typically relatively low.

To complete the pallet 100 described above, an exemplary base 102 constructed from 40-lb. to 60-lb. grade Styrofoam pieces 106 having a height "H2" of approximately 3 inches may be utilized. A base 102 having these characteristics may withstand a maximum load of approximately 40 lbs/in^2. The exemplary load of 2,200 lbs. would preferably utilize a base with a footprint (as defined above) of between about 25% to 40%, and most preferably approximately 30%, of the total surface area "W4" x "W5" of the bottom surface 62 of the layer 54a. While a base having a larger footprint may be used, the larger the footprint, the more difficult it may be to insert the forks (e.g., 56, Fig. 6) of a forklift into the channels 108. It is clear that the base 102 of the present invention uses much less material than conventional pallets. Additionally, it will be appreciated that plastic foam/Styrofoam is a relatively inexpensive material as compared to the materials from which conventional pallets are constructed, e.g., plastic or wood.

Referring to Figs. 2 and 3, after the pallet 100 is created by wrapping one or more layers (e.g., 54a) in flexible film 110 and adhering a base 102 thereto, the remaining layers 54 may be loaded onto the pallet 100. Then, the entire load 50 may be wrapped around its circumference, i.e., around axis CC (a vertical axis which is generally perpendicular to axes AA and BB, and plane ABAB), with flexible film such as stretch wrap, shrink wrap, or the like in a manner well known in the art in order to laterally secure the load 50.

Fig. 6 shows an exemplary load 50 on the pallet 100 of the present invention being lifted by the forks 56 of a forklift (not shown). When the wrapped load 50 is lifted, the lifting force "L3", "L4" of the forks 56 on the load 50 in combination with the weight "L5", "L6" of the outer periphery 210 of the load (e.g., the outer row(s) of packages) may cause the load to arch somewhat (as indicated by "DD"). However, since the support structure 104 of the pallet 100 is securely wrapped in two directions (e.g., around axes AA and BB, Fig. 3), and due to the friction between the individual packages (e.g., between packages 130 and 132, 132 and 134, 134 and 136) within the wrapped support structure 104, the support structure 104 does not allow this arching effect to threaten the stability of the load 50.

With reference to Figs. 1-6, a method for producing the pallet 100 described above is also disclosed. The method may comprise the first step of wrapping at least one of the multiple layers (e.g., the lowermost layer 54a) of the load 50 with a flexible film 110 around a first axis AA or BB. The next step involves wrapping the same layer(s) 54a with a flexible film 110 around a second axis BB or AA which is generally perpendicular to the first axis and preferably located on the same plane ABAB. Then, a base 102 is adhered to the flexible film 110. If a plastic foam such as Styrofoam is utilized for the base 102, the step of adhering the base 102 to the flexible film 110 may comprise providing plastic foam pieces which are not fully cured, pressing the plastic foam pieces onto the flexible film, and then allowing the plastic foam pieces to fully cure, thereby causing the pieces to adhere to the flexible film 110. Alternatively, as noted above, a base 102 constructed from

plastic foam which has already cured may be utilized. At least one surface on the base 102 (e.g., surface 107 on each of the pieces 106, Fig. 3) may be heated until that surface 107 is tacky or partially melted. Then, the tacky surface 107 may be pressed to the flexible film 110 on the bottom surface 62 of the packages 52. When the base 102 cools down, it will be adhered to the flexible film 110.

While illustrative and presently preferred embodiments of the invention have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed, and that the appended claims are intended to be construed to include such variations, except as limited by the prior art.